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Original Article

Application of stent placement or nasojejunal feeding tube placement in patients with malignant gastric outlet obstruction: A retrospective series of 38 cases

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Abstract

Background: Malignant gastric outlet obstruction (MGOO), a late complication of advanced carcinoma of the stomach, duodenum, periampulla or pancreas, causes significant malnutrition and morbidity. The current treatment for MGOO is palliative in nature, with the goal of maintaining the best quality of life possible during the terminal phase of the illness.
Methods: A total of 38 patients with MGOO were enrolled in our institute from January 2007 to December 2011; 18 patients received nasojejunal (NJ) feeding tube placement, and 20 patients received duodenal stent placement. Food intake, measured by the gastric outlet obstruction scoring system (GOOSS), survival, complications, recurrent obstructive symptoms, and reintervention were evaluated in both groups.
Results: No significant differences were noted with regard to patient characteristics, survival rate (NJ group: 140 days vs. stent group: 186 days, $p = 0.617$), and complication rate. Recurrent obstructions developed more frequently in patients treated with NJ feeding tube placement than in those treated with duodenal stent placement [12 (66.7%) vs. 5 (25%), $p = 0.014$]. The duration for patency was shorter in the NJ group than in the stent group (median: 40 days vs. 130 days, $p = 0.009$). The GOOSS score was significantly better in the stent group than in the NJ group.
Conclusion: NJ tube placement and duodenal stent placement are both effective and safe treatments for patients with MGOO. Both groups had similar complication rates and survival rates. While NJ tube placement is associated with lower costs, stent placement has a longer duration of patency, superior oral intake, and a lower reintervention rate. We suggest that stent placement should be considered first in patients who are able to afford the related costs.

Keywords: malignant gastric outlet obstruction; metallic stent; nasojejunal feeding tube

1. Introduction

Malignant gastric outlet obstruction (MGOO), a late complication of advanced carcinoma of the stomach, duodenum, periampulla or pancreas, typically results in significant malnutrition and morbidity.[1–3] The majority of patients with MGOO are in a preterminal stage, and have short life expectancies.[1] Symptoms of MGOO include persistent severe nausea and vomiting, poor oral intake, and body weight loss,[2] which customarily lead to dehydration, malnutrition, cachexia, and poor quality of life.[4] When dealing with this type of situation, possible palliative chemotherapy and radiotherapy cannot be administered due to generalized cachexia.

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At present, commonly used treatments for MGOO are surgical gastrojejunostomy (GJ) and stent placement.[3] GJ has better long-term outcomes, although stent placement has superior short-term outcomes.[4] In contrast, however, GJ has a higher mortality rate, morbidity risk, prolonged hospital stay, and delayed symptom relief as compared with metallic stents, and stent placement has a higher occlusion rate.[4] In consideration of generalized cachexia, advanced age, or multiple comorbidities, it would appear that stent placement is the only palliative option to be considered for patients with MGOO.

However, metallic stents are so expensive that many patients cannot afford to use them, and in such cases tube feeding can be considered. The cost of a nasojejunal (NJ) tube is cheaper than that of a metallic stent. Patients with cerebrovascular accident, perioperative status, burns, sepsis, pancreatitis, gastrointestinal tract cancer or surgery, and miscellaneous illnesses are generally considered for NJ tube feeding.[5] If obstruction of the NJ tube occurs, tube replacement can easily be performed. The aim of this study was to compare the clinical outcomes of NJ tube placement with stent placement in patients with MGOO.

2. Methods

2.1. Patients

A total of 38 patients with inoperable malignant carcinoma causing MGOO were retrospectively reviewed at the Taipei Veterans General Hospital from January 2007 to December 2011. Initially, MGOO was confirmed by endoscopy or radiological studies. Exclusion criteria included prior patient subtotal or total gastrectomy, or complete obstruction of the gastric outlet. However, it should be noted that all the patients had obstructive symptoms, such as nausea, vomiting, and poor oral intake. This study was approved by the Institutional Review Board of the Taipei Veterans General Hospital (No. 2012-01-002AC).

2.2. Procedure for NJ tube placement

The NJ tube (Freka Trelumina, CH/Fr 16/9, 150 cm; Fresenius Kabi Ltd, Runcorn, UK) was inserted under fluoroscopic guidance. A 5-Fr modified pigtail catheter and guide wire (0.035 in, 260 cm; Terumo, Tokyo, Japan) were introduced into the stomach, and passed through the pylorus to the duodenum. Water-soluble radiographic contrast was injected to map the route of duodenum and jejunum after which the wire was advanced into the proximal jejunum. Thereafter, an NJ tube was introduced with the support of another stiff Terumo guide wire. Finally, the tube was pushed to the proximal jejunum about 10 cm below the ligament of Treitz.

2.3. Procedure for stent placement

All stents were deployed using a standard gastroscope (JF-240/260; Olympus, Japan) under fluoroscopic guidance. A guide wire (0.035 in, 460 cm, Hydra Jagwire; Boston Scientific Corporation, Natick, MA, USA) was introduced through the working channel of the endoscope to 20 cm beyond the site of obstruction. Water-soluble radiographic contrast was injected to determine the length and location of the stricture. The stent was chosen by the length of an additional 1–3 cm on either side of the stricture. The uncovered stent (WallFlex duodenal stent; Boston Scientific Corporation, Natick, MA, USA) was deployed under fluoroscopic guidance. One day later, radiological follow-up was undertaken to evaluate the expansion and location of the inserted metallic stent.

2.4. Evaluation of gastric outlet obstruction scoring system

The primary outcome of the study was the improvement of food intake. It was measured by the gastric outlet obstruction scoring system (GOOSS) score, with 0 = no oral intake, 1 = liquid diet, 2 = soft diet, and 3 = regular diet.[2] Based on these data, clinical success was defined as relief of obstructive symptoms and improvement of oral intake. Other outcomes including technical success, complications, persistent and recurrent obstructive symptoms, reinterventions, and survival were also evaluated.

Technical success of the NJ tube or stent placement was defined as adequate deployment and positioning of the NJ tube or stent with improved food intake. Both minor and major complications were included. Minor complications were defined as those that were not life-threatening conditions and did not require further aggressive treatment, such as abdominal pain, nausea, and vomiting. Major complications were defined as life-threatening or severe complications, such as aspiration pneumonia, bleeding, perforation, stent migration, and sepsis. Reobstruction was defined as obstructive symptoms developing after treatment, such as persistent severe nausea, vomiting, and poor oral intake. The dysfunction or dislocation of NJ tube was also considered reobstruction. Reintervention was defined as repeated treatment for recurrent obstruction.

2.5. Data collection

Data were obtained from patient notes, radiology reports, procedure notes, and telephone interviews. The collected data included patient demographics, procedural characteristics, complications, GOOSS score, duration of tube or stent patency, reinterventions, and survival rate.

2.6. Statistical analysis

The demographics, GOOSS score, complications, recurrent obstructions, reintervention, time to reintervention, and 30-day mortality were calculated using the Mann–Whitney U test, Chi-square test, or Fisher exact probability test as was appropriate. Survival curves and incidence of recurrence were analyzed by Kaplan–Meier analysis. A p value <0.05 was considered to be statistically significant. All statistical

analyses were performed using the Statistical Package for Social Sciences (SPSS version 17.0 for Windows; SPSS Inc., Chicago, IL, USA).

3. Results

3.1. Patient characteristics

The study included 38 patients of which 18 received NJ feeding replacement (mean age: 71 ± 16 years, range 36–92 years) and 20 underwent duodenal stent placement (mean age: 70 ± 18 years, range 31–94 years). There were no significant differences between these two groups with regard to age, gender, tumor stage, tumor origin, tumor pathology, performance status, GOOSS score, obstructive location, body mass index, and administration of prior adjuvant radiotherapy, chemotherapy or both (Table 1). Most of our patients suffered from terminal gastric adenocarcinoma; therefore, we further compared major subgroups between the NJ and stent groups. However, even after additional comparison, no significant differences in tumor origin, tumor stage, and pathology were noted.

Table 1
Comparison of the demographic data of NJ feeding tube placement and stent placement.

Parameter	NJ tube ($n = 18$)	Stent ($n = 20$)	p
Age (y/o)	70.7 ± 16.0	69.6 ± 18.4	0.836
Gender (M:F) (%)	11/7 (61.1/38.9)	13/7 (65/35)	0.804
BMI	18.5 ± 2.69	19.6 ± 2.47	0.262
Performance status (%)			0.375
0	0	3 (15)	
1	1 (5.6)	3 (15)	
2	2 (11.1)	2 (10)	
3	10 (55.6)	8 (40)	
4	5 (27.7)	4 (20)	
Tumor origin (%)			0.476
Stomach	11 (61.1)	16 (80)	
Duodenum	1 (5.6)	0	
Pancreas	2 (11.1)	2 (10)	
Metastatic tumor	4 (22.2)	2 (10)	
Tumor stage (%)			0.499
I	0	0	
IIA	1 (5.6)	0	
IIB	1 (5.6)	0	
IIIA	1 (5.6)	1 (5)	
IIIB	0	0	
IV	15 (83.2)	19 (95)	
Pathology of cancer (%)			0.495
Adenocarcinoma	14 (77.7)	17 (85)	
Metastatic cancer	0	1 (5)	
Poorly differentiated carcinoma	1 (5.6)	0	
Unknown	3 (16.7)	2 (10)	
Site of obstruction (%)			0.531
Antrum	5 (27.7)	9 (45)	
Pylorus	7 (39)	8 (40)	
Bulb of duodenum	1 (5.6)	0	
Second portion of duodenum	5 (27.7)	3 (15)	
Prior radiation and/or chemotherapy (%)	9 (50)	11 (55)	0.418

BMI = body mass index; GOOSS = gastric outlet obstruction scoring system; NJ = nasojejunal; SD = standard deviation. All data were expressed as mean ± SD.

3.2. Technique success

The NJ feeding tubes and duodenal stents were successfully deployed in all the patients.

3.3. Clinical success

Improvement in oral intake was observed in both groups (Table 2). Information about food intake during the 30-day follow-up was obtained from 8/18 (44%) patients after NJ feeding tube placement, and from 18/20 (90%) patients after duodenal stent placement (Table 2). The GOOSS scores were significantly different between the NJ and stent groups on 1-day, 7-day, and 30-day follow-ups, respectively. It was observed that the patients treated with stent placement had better GOOSS scores than those treated with an NJ tube (Table 2).

3.4. Complications and reinterventions

Minor complications were noted after 1-week follow-up in six patients in the NJ group and seven patients in the stent group. The most common minor complications after NJ feeding tube placement were abdominal pain, vomiting, and diarrhea. The same symptoms, except for diarrhea, were also noted in the stent group. Aspiration pneumonia was detected in both groups and stent migration developed in one patient after duodenal stent placement. However, there were no differences between these two groups as regards to minor and major complications (Table 3).

Table 2
Comparison of oral intake.

Parameter	NJ tube ($n = 18$)	Stent ($n = 20$)	p
GOOSS score before treatment (%)			0.087
0	18 (100)	17 (85)	
1	0	3 (15)	
2	0	0	
3	0	0	
24-h GOOSS			0.016*
0	1	0	
1	17	13	
2	0	6	
3	0	1	
1-week GOOSS			<0.001*
0	1	0	
1	14	1	
2	0	12	
3	0	6	
30-day GOOSS			<0.001*
0	1	0	
1	7	1	
2	0	10	
3	0	7	

*$p < 0.05$.
GOOSS = gastric outlet obstruction scoring system; NJ = nasojejunal.

Table 3
Complications related to the procedures.

Parameter	NJ tube ($n = 18$)	Stent ($n = 20$)	p
Minor complications (%)			0.396
None	12 (66.6)	13 (65)	
Abdominal pain	1 (5.6)	2 (10)	
Nausea	0	2 (10)	
Vomiting	3 (16.7)	3 (15)	
Diarrhea	2 (11.1)	0	
Major complications (%)			0.112
None	15 (83.3)	19 (95)	
Aspiration pneumonia	3 (16.7)	0	
Stent migration	0	1 (5)	

NJ = nasojejunal.

A total of 17 patients had obstructive episodes after NJ tube or stent placement was performed, but only 14 patients received further intervention. The remaining three patients were provided hospice care because they were at a terminal stage of cancer. Recurrent obstructions developed more frequently in the NJ group than in the stent group (Fig. 1). In the NJ group, 12 recurrent episodes were noted after NJ tube placement, of which 11 patients underwent reintervention: 6 patients received NJ tube placement, 4 patients received stent placement, and 1 patient underwent jejunostomy. In the stent group, a total of five recurrent episodes were noted after stent placement, but only three underwent reintervention. One stent migrated to the third portion of duodenum 38 days after stent placement, which was subsequently removed via endoscope. Another two episodes of stent obstruction occurred due to tumor ingrowth; one patient received a new stent placement, and the other patient received argon plasma coagulation ablation.

The duration for patency was shorter in the NJ group as compared with the stent group (median: 40 days vs. 130 days, $p = 0.009$). The time to reintervention was modestly shorter in the NJ group than in the stent group (median: 44 days vs. 96 days, $p = 0.266$) (Fig. 2).

3.5. Survival

The 30-day mortality rate was not different between these two groups (16.7% vs. 20%, $p = 1.000$). There were similar median survivals in both groups (140 days vs. 186 days, $p = 0.617$) (Fig. 3).

4. Discussion

In this retrospective study, we compared NJ tube placement with stent placement, and further evaluated whether NJ tube placement could be used as an alternative method to replace stent placement in patients with MGOO. There are some limitations in performing both procedures, such as facial and cranial injuries, anatomic difficulties, the inability to pass a guide wire through the stricture, multiple intestinal strictures or obstructions, and recent gastrointestinal surgery with fresh sutures.[6–8]

Complications related to both procedures may affect the severity of the underlying disease and are also associated with a longer hospital stay.[4] Minor complications, such as abdominal pain and vomiting, may develop after performing both procedures. Intractable nausea and vomiting are common in patients with MGOO,[9] and having an uncomfortable sensation over the pharyngeal region is common after NJ tube placement. However, this could lead to further vomiting and NJ tube dislocation. In our study, one patient developed NJ tube dislocation 1 day after his procedure due to severe vomiting. In contrast, these minor complications did not damage the effectiveness of the metallic stent. Diarrhea is a common complication of enteral feeding, and its etiology may be a multifactorial process, such as concurrent use of antibiotics, altered bacterial flora, formula composition, method of infusion, hypoalbuminemia, and diet contamination.[10] The

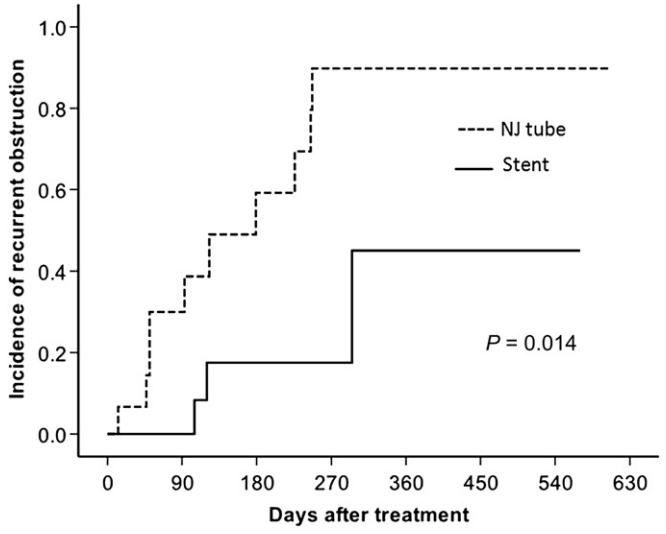

Fig. 1. The incidence of recurrent obstructions censored for patients with malignant gastric outlet obstruction who are still alive after treatment with either nasojejunal (NJ) feeding tube placement or stent placement in patients.

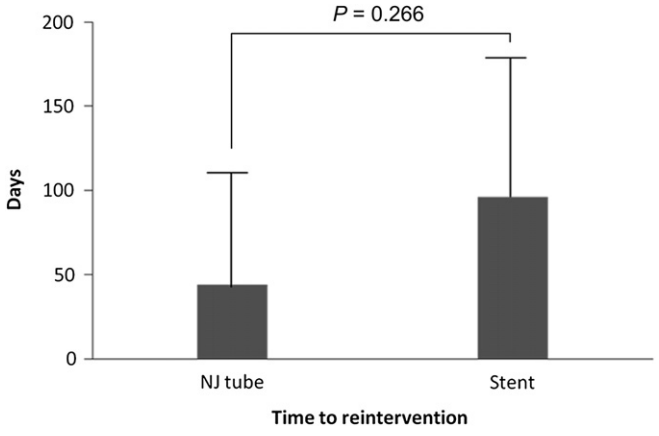

Fig. 2. Time to reintervention after treatment with either nasojejunal (NJ) feeding tube placement or stent placement in patients with malignant gastric outlet obstruction.

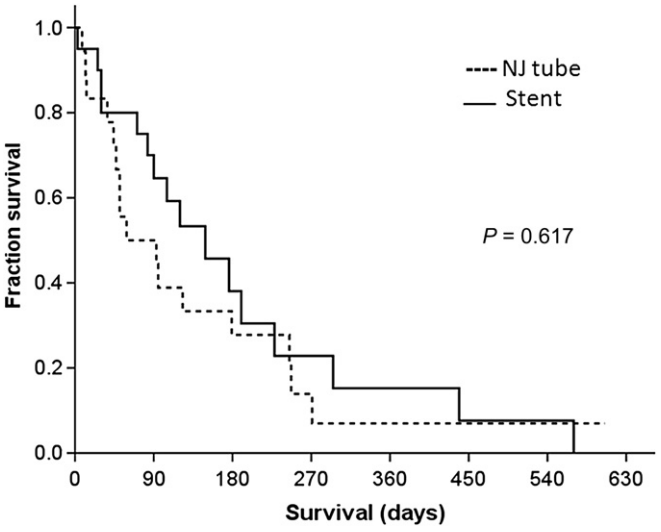

Fig. 3. Overall survival curves after treatment with either nasojejunal (NJ) feeding tube placement or stent placement in patients with malignant gastric outlet obstruction.

occurrence of diarrhea varies in the related literature from 2.3% to 68%,[11,12] and it was 11.1% in our NJ group.

The major complication rates were similar in both of our groups, especially with regard to aspiration pneumonia. The development of aspiration pneumonia after tube feeding has been reported to range from 2% to 95%,[11,13] and the rate in our study was 22.2%. Aspiration of diet can develop without any obvious vomiting, particularly in those patients with poor mental or performance status.[5] Regurgitation is usually silent until vital signs are compromised or pneumonia develops.[5] Our patients in later stages of the disease with generalized cachexia are particularly at risk of developing aspiration pneumonia. Other severe complications, such as bleeding or perforation, did not occur in either of our groups.

The manufacturer of the NJ tube (Fresenius Kabi Ltd, UK) suggests that the duration of tube use can be up to 6 weeks, and the American Gastroenterological Association in 1995 also recommended tube feeding for short-term (<30 days) nutritional support.[10] In our study, the mean duration of NJ tube use was 40 days, and the maximal duration was 191 days. Therefore, an NJ tube could be used until dysfunction occurs. The causes of NJ tube dysfunction in our study were food- or drug-related clogging, unintentional tube removal, and tube dislocation. Ciocon et al reported in a prospective study that events of agitation and self-extubation after tube feeding were 67% and 39%, respectively.[14] The occurrence of unintentional tube removal was 11.1% in our study. Therefore, stent placement should be considered in those patients with agitation and self-extubation.

The common causes of reintervention after stent placement are tumor overgrowth or ingrowth, stent migration, food impaction, and biliary obstruction.[8] Laasch et al reported that 20–25% of patients after stent placement needed endoscopic reintervention,[15] and this figure was 25% in our series. In our study, stent migration usually resulted from the decrease of obstruction after chemotherapy. According to a prospective study,[16] chemotherapy and radiation therapy would likely decrease tumor burden and slow the rate of tumor growth. Thus, such palliative treatment could further prolong stent patency.

Although our stent for MGOO was uncovered to prevent migration and could be obstructed by tumor ingrowths under a longer period of observation, the interval of recurrent obstructive symptoms was shorter in the NJ group than that observed in the stent group. The smaller and longer lumen of the NJ tube as compared with the metallic stent could be the primary reason for this difference.

The patients after NJ placement could only be fed with an NJ formula diet (GOOSS = 1), but patients after stent placement could eat a liquid diet or regular diet (GOOSS = 1–3) depending on the clinical status of the patient. Therefore, the GOOSS score in the stent group was better than in the NJ group, and there was a significant difference at 24-hour, 1-week, and 30-day intervals. In addition, long-term results with regard to recurrent obstructive symptoms were better after stent placement than after NJ tube placement. However, despite adequate nutrition, the long-term prognosis of both groups was still poor because of the underlying disease.

Median survival after NJ tube placement in this study was 140 days, and no previous related data were available in the current literature. Median survival after stent placement in our study was 186 days, as compared with other studies that ranged from 7 to 152 days.[8,16–23] Jemal et al reported that patients with a primary pancreatic carcinoma had a shorter survival duration than those with a gastric or duodenal carcinoma.[24] The median survival period in our patients was slightly longer than in other studies, and this could be the reason that most of our patients had gastric carcinoma. No previous studies were available regarding the difference of survival rates in both groups. In our study, there was no significant difference in survival rates between the two groups; this might result from no definite treatment about the malignancy itself at a poor performance status stage. In addition, no difference in outcomes between gastric carcinoma and non-gastric carcinoma subgroups was found (data not shown in the result).

Fees related to NJ tube or metallic stent in MGOO are not covered by the Bureau of National Health Insurance in Taiwan. The prices of an NJ tube and metallic stent are around US$100 and US$2300, respectively, in Taiwan. Therefore, the patients with a lower economic status may choose NJ tube placement to improve their nutrition. Although a higher dysfunction rate is associated with NJ tube, the use of NJ tube could still provide nutrition and achieve a similar survival rate as compared with that of the metallic stent.

Despite the limitations of this retrospective study, our study suggests that NJ tube placement and duodenal stent placement are both effective and safe treatment methods for patients with MGOO. Both groups had similar complication rates and survival rates. While NJ tube placement is associated with lower costs, stent placement has a longer duration

of patency, a better oral intake, and a lower reintervention rate. We suggest that stent placement should be considered first in patients who are able to afford the related costs. Further large and randomized controlled trials are needed to compare the quality of life and survival after NJ tube placement with that of metallic stent placement in patients with MGOO.

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